

SEQUENCE LISTING

5 <110> Eijiro WATANABE et al.; Sumitomo Chemical Company Limited

<120> Raffinose Synthase Genes and Their Use

<150> JP 10/120550

10 <151> 1998-04-30

<150> JP 10/120551

<151> 1998-04-30

15 <150> JP 10/345590

<151> 1998-12-04

<150> JP 10/351246

<151> 1998-12-10

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35 35 40 45

Gln His Tyr Ala Leu Pro Thr Arg Asp Cys Leu Phe Val Asp Pro Leu

50 55 60

His Asp Gly Lys Thr Met Leu Lys Ile Trp Asn Leu Asn Lys Cys Ser

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Gly Val Leu Gly Leu Phe Asn Cys Gln Gly Gly Gly Trp Cys Pro Val

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	Phe Ala Ser Pro Gln Asp Ile Glu Trp Gly Lys Gly Lys His Pro Val	
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	Lys Leu Lys Leu Leu Lys Tyr Thr Glu Ser Val Glu Val Ser Leu Glu	
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	Arg Lys Ser Ile Gln Phe Ala Pro Ile Gly Leu Val Asn Met Leu Asn	
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15	Ala Arg Ile Gly Val Arg Gly His Gly Glu Met Arg Val Phe Ala Ser	
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	Glu Lys Pro Glu Ser Val Lys Ile Asp Gly Glu Ser Val Glu Phe Asp	
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	Ile Ser Gly Gly Pro Ile Tyr Val Ser Asp Ser Val Gly Lys His Asn	
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40	ttc aag ttg ctt aag aag ctt gtt cta cct gat ggc tcc att ttg cgg	142

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	Leu	His	Asp	Gly	Lys	Thr	Met	Leu	Lys	Ile	Trp	Asn	Leu	Asn	Lys	Cys	
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	Ser	Glu	Lys	Pro	Glu	Ser	Val	Lys	Ile	Asp	Gly	Glu	Ser	Val	Glu	Phe	
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	Ser Arg Leu Ser Val Val Glu Tyr Leu Phe				
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	Lys Pro Phe Pro Ile Lys Gly Val Glu Cys Phe Ala Met Tyr Phe Thr					
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	Lys Glu Lys Lys Leu Ile Leu Ser Gln Leu Ser Asp Thr Ile Glu Ile					
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	Asn Glu Asp Lys Met Val Gln Val Gly Ile Lys Gly Ala Gly Glu Met					
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	Met Val Tyr Ser Ser Glu Lys Pro Lys Ala Cys Arg Val Asn Gly Glu					
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	Asp Met Glu Phe Glu Tyr Glu Glu Ser Met Ile Lys Val Gln Val Thr					
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	gagttttttt agctcttatt tcctaagaaa ttaatagcaa aagttttgca taact atg	238
		Met
	gct cca agc ttt agc aag gaa aat tcc aag acg tgt gat gag gtt gca	286
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	Asn His Asp Asp Cys Asn Thr Cys Pro Ile Ile Ser Leu Glu Glu Ser	
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	Ile Thr Ala Ile Ser Lys Met Gly Phe Asp Gly Leu Phe Val Gly Phe	
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20	gat gct cca gag ccc aag gcc cgg cac gtt gta tcc gtg ggc cag ctc	478
	Asp Ala Pro Glu Pro Lys Ala Arg His Val Val Ser Val Gly Gln Leu	
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	Lys Gly Ile Pro Phe Met Ser Ile Phe Arg Phe Lys Val Trp Trp Thr	
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	Thr His Trp Thr Gly Ser Asn Gly Arg Asp Leu Glu His Glu Thr Gln	
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	Val Asp Lys Phe Gly Trp Cys Thr Trp Asp Ala Phe Tyr Leu Lys Val	
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	Glu Pro Tyr Gly Val Trp Glu Gly Val Lys Gly Leu Val Glu Asn Gly	
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	Asn Val Thr Val Thr Ala Ser Pro Tyr Leu Ala Asp Lys Asp Gly Glu	
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	Val Ile Ala Ser Met Glu His Cys Asn Asp Phe Met Phe Leu Gly Thr	
	245 250 255	
5	gaa gcc atc tct cta ggt cgt gtc ggt gat gac ttt tgg tgc acg gat	816
	Glu Ala Ile Ser Leu Gly Arg Val Gly Asp Asp Phe Trp Cys Thr Asp	
	260 265 270	
	cca tct ggc gac att aac ggc acg tat tgg ctg caa gga tgt cac atg	864
	Pro Ser Gly Asp Ile Asn Gly Thr Tyr Trp Leu Gln Gly Cys His Met	
	275 280 285	
10	gtc cac tgt gcc tac aac agt ctt tgg atg gga aat ttc atc cag cct	912
	Val His Cys Ala Tyr Asn Ser Leu Trp Met Gly Asn Phe Ile Gln Pro	
	290 295 300	
	gat tgg gac atg ttt cag tcc aca cat cct tgt gct gag ttc cat gct	960
	Asp Trp Asp Met Phe Gln Ser Thr His Pro Cys Ala Glu Phe His Ala	
15	305 310 315 320	
	gct tca cgt gcc atc tcc ggt ggg ccc att tac atc agc gat tgt gtg	1008
	Ala Ser Arg Ala Ile Ser Gly Gly Pro Ile Tyr Ile Ser Asp Cys Val	
	325 330 335	
	ggc cag cac gat ttc gat ctc ttg agg aga ctc gtt ttg cct gac ggt	1056
20	Gly Gln His Asp Phe Asp Leu Leu Arg Arg Leu Val Leu Pro Asp Gly	
	340 345 350	
	tcg att ttg agg tgt gag tac tat gct ctc cca act cgt gac cgt ctc	1104
	Ser Ile Leu Arg Cys Glu Tyr Tyr Ala Leu Pro Thr Arg Asp Arg Leu	
	355 360 365	
25	ttt gaa gac cct ctt cat gat ggc aaa acc atg ctc aag att tgg aac	1152
	Phe Glu Asp Pro Leu His Asp Gly Lys Thr Met Leu Lys Ile Trp Asn	
	370 375 380	
	ttg aac aag tac act gga atc atc gga gca ttc aac tgt caa gga gga	1200
	Leu Asn Lys Tyr Thr Gly Ile Ile Gly Ala Phe Asn Cys Gln Gly Gly	
30	385 390 395 400	
	gga tgg tgc aga gaa act cga cgc gac caa tgc ttc tcc caa tgc gtt	1248
	Gly Trp Cys Arg Glu Thr Arg Arg Asp Gln Cys Phe Ser Gln Cys Val	
	405 410 415	
	aac acg tta acc gcc aca aca aat cct aat gac gtt gaa tgg aac agt	1296
35	Asn Thr Leu Thr Ala Thr Thr Asn Pro Asn Asp Val Glu Trp Asn Ser	
	420 425 430	
	ggg aac aac ccg atc tcc att gaa aac gtt gaa gag ttt gct ttg ttc	1344
	Gly Asn Asn Pro Ile Ser Ile Glu Asn Val Glu Glu Phe Ala Leu Phe	
	435 440 445	
40	ttg tct caa tcc aag aag ctt gtg ttg tcc ggg caa aac gat gat ctc	1392

	Leu Ser Gln Ser Lys Lys Leu Val Leu Ser Gly Gln Asn Asp Asp Leu	
	450 455 460	
	gag atc aca tta gag ccc ttc aag ttc gag ctc atc act gtc tca cca	1440
	Glu Ile Thr Leu Glu Pro Phe Lys Phe Glu Leu Ile Thr Val Ser Pro	
5	465 470 475 480	
	gtt gtc acc att gag ggc agt tcg gtt cag ttt gct cca atc gga ttg	1488
	Val Val Thr Ile Glu Gly Ser Ser Val Gln Phe Ala Pro Ile Gly Leu	
	485 490 495	
	gtt aac atg ctt aac act agc ggt gcg att cga tcc ttg gtt tat cat	1536
10	Val Asn Met Leu Asn Thr Ser Gly Ala Ile Arg Ser Leu Val Tyr His	
	500 505 510	
	gag gaa tcc gtt gag atc ggt gtt cgt ggt gct gga gaa ttc agg gtt	1584
	Glu Glu Ser Val Glu Ile Gly Val Arg Gly Ala Gly Glu Phe Arg Val	
	515 520 525	
15	tat gca tcg aag aaa cct gtg agc tgc aag att gat ggt gaa gat gtt	1632
	Tyr Ala Ser Lys Lys Pro Val Ser Cys Lys Ile Asp Gly Glu Asp Val	
	530 535 540	
	gag ttt ggg tac gaa gag tca atg gtg atg gtt caa gtg cct tgg tct	1680
	Glu Phe Gly Tyr Glu Glu Ser Met Val Met Val Gln Val Pro Trp Ser	
20	545 550 555 560	
	gca cca gag ggt ttg tct tct att aag tat ttg ttt tag agttatttaa	1729
	Ala Pro Glu Gly Leu Ser Ser Ile Lys Tyr Leu Phe	
	565 570	
	ggtgcttaat tgaaaaaaaa aaaaaaaaaa aaa	1762
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	<211> 25	
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	<220>	
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35	ccaatctgat catgcttgtg ccgaa	25
	<210> 10	
	<211> 30	
	<212> DNA	
40	<213> Artificial Sequence	

<220>

⟨223⟩ Designed oligonucleotide primer to obtain raffinose synthase gene.

5 $\langle 400 \rangle$ 10

ggaacaaagt tatgcactat tatttaaggt 30

<210> 11

<211> 27

10 <212> DNA

<213> Artificial Sequence

 $\langle 220 \rangle$

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

15

<400> 11

ctaccaaatt ccacaactta aagttca 27

<210> 12

20 $\langle 211 \rangle$ 32

<212> DNA

⟨213⟩ Artificial Sequence

 $\langle 220 \rangle$

25 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 12

ggaataataa gcttcacaca tactgtactc tc 32

30 $\langle 210 \rangle$ 13

<211> 30

<212> DNA

⟨213⟩ Artificial Sequence

35 $\langle 220 \rangle$

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 13

atggctccaa gctttagcaa ggaaaattcc 30

40

<210> 14
<211> 30
<212> DNA
<213> Artificial Sequence
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<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 14
10 tcaaaataag tactcaacag tggtaaaacc 30

<210> 15
<211> 30
<212> DNA
15 <213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

20 <400> 15
ttggaagaga agacccgcc gggaatcgtc 30

<210> 16
<211> 30
25 <212> DNA
<213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.
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<400> 16
ttaagccccg gcgagagctc tggccggaca 30

<210> 17
35 <211> 30
<212> DNA
<213> Artificial Sequence

<220>
40 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.

	<400> 17	
	accaatccaa aatctcatca aataatcgca	30
5	<210> 18	
	<211> 25	
	<212> DNA	
	<213> Artificial Sequence	
10	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
	<400> 18	
	aaataatagg ggcagtacaa attacaccac	30
15	<210> 19	
	<211> 29	
	<212> DNA	
	<213> Artificial Sequence	
20	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
	<400> 19	
25	atggctccac cgagcgtaat taaatccga	29
	<210> 20	
	<211> 30	
	<212> DNA	
30	<213> Artificial Sequence	
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	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
35	<400> 20	
	ctaaaactca tacttaatag aagacaaacc	30
	<210> 21	
	<211> 41	
40	<212> DNA	

⟨213⟩ Artificial Sequence

$\langle 220 \rangle$

5 <223> Designed oligonucleotide primer to obtain raffinose synthase gene,
n is i.

<400> 21

cgatggatgg gnaanttnat ncancngan tggganatgt t 41

10 $\langle 210 \rangle$ 22

<211> 32

<212> DNA

<213> Artificial Sequence

15 $\langle 220 \rangle$

<223> Designed oligonucleotide primer to obtain raffinose synthase gene,
n is i, r is a or g.

<400> 22

20 ggccacatnt tnacnarncc natnggngcn aa 32

<210> 23

$\langle 211 \rangle$ 30

<212> DNA

25 <213> Artificial Sequence

 $\langle 220 \rangle$

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

30 <400> 23

tggttactagg cgaaacaaga gtagctctga 30

<210> 24

<211> 47

35 <212> DNA

<213> Artificial Sequence

 $\langle 220 \rangle$

40 <223> Designed oligonucleotide primer to obtain raffinose synthase gene,
 n is i.

	<400> 24	
	cgaggnggnt gncncncngg nttngtnatn atngangang gntggca	47
5	<210> 25	
	<211> 29	
	<212> DNA	
	<213> Artificial Sequence	
10	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene, n is i, y is t or c, r is a or g.	
	<400> 25	
15	atyttrtcna cngcnarrtc ytccatngt	29
	<210> 26	
	<211> 38	
	<212> DNA	
20	<213> Artificial Sequence	
	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene, n is i, y is t or c.	
25	<400> 26	
	ggnacntant ggytncangg ntgncanatg gtncantg	38
	<210> 27	
30	<211> 32	
	<212> DNA	
	<213> Artificial Sequence	
	<220>	
35	<223> Designed oligonucleotide primer to obtain raffinose synthase gene, n is i, r is a or g.	
	<400> 27	
	ggccacatnt tnacnarncc natnggngcn aa	32
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<210> 28
 <211> 26
 <212> DNA
 <213> Artificial Sequence
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 <400> 28
 10 atctatttgt catgacgatg atccga 26
 <210> 29
 <211> 30
 <212> DNA
 15 <213> Artificial Sequence
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 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.
 20 <400> 29
 ggccctcatt cccatattgg gatgacctc 30
 <210> 30
 <211> 30
 25 <212> DNA
 <213> Artificial Sequence
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 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.
 30 <400> 30
 aagcatgcc aacatacaca tgctcaacag 30
 35 <210> 31
 <211> 30
 <212> DNA
 <213> Artificial Sequence
 40 <220>

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 31
agacccgggg aaagctttgg ggttactact 30

5

<210> 32
<211> 28
<212> DNA
<213> Artificial Sequence

10

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 32
15 tggatgggaa actttataca ccctgact 28

<210> 33
<211> 28
<212> DNA
20 <213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

25 <400> 33
gacatgttcc catctacaca cccttgatg 28

<210> 34
<211> 30
30 <212> DNA
<213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

35 <400> 34
ccaatttatg ttagtgatgt tgttggcaag 30

<210> 35
40 <211> 26

	<212> DNA	
	<213> Artificial Sequence	
	<220>	
5	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
	<400> 35	
	tcgactccca gggtagaatt gtcac	26
10	<210> 36	
	<211> 35	
	<212> DNA	
	<213> Artificial Sequence	
15	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene, n is i.	
	<400> 36	
20	cgattnaang tntggtggac nacncantgg gtngg	35
	<210> 37	
	<211> 38	
	<212> DNA	
25	<213> Artificial Sequence	
	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene, n is i, r is a or g.	
30	<400> 37	
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	<210> 38	
35	<211> 30	
	<212> DNA	
	<213> Artificial Sequence	
	<220>	
40	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	

	<400> 38	
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5	<210> 39	
	<211> 26	
	<212> DNA	
	<213> Artificial Sequence	
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	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
	<400> 39	
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15	<210> 40	
	<211> 30	
	<212> DNA	
	<213> Artificial Sequence	
20	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
	<400> 40	
25	ggattcgaca caaacgccca cgtcatcgtc	30
	<210> 41	
	<211> 27	
	<212> DNA	
30	<213> Artificial Sequence	
	<220>	
	<223> Designed oligonucleotide primer to obtain raffinose synthase gene.	
35	<400> 41	
	ccacgtgcac caccogaact tatcgac	27
	<210> 42	
	<211> 30	
40	<212> DNA	

<213> Artificial Sequence

<220>

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

5

<400> 42

aacatcgata ccatcggagt catgtccaat 30

<210> 43

10 <211> 30

<212> DNA

<213> Artificial Sequence

<220>

15 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 43

gtaggggttc atatgaacac cttcaagctc 30

<210> 44

20 <211> 29

<212> DNA

<213> Artificial Sequence

<220>

25 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 44

30 tctacgtctg gcacgcgctt tgcggctac 29

<210> 45

<211> 31

<212> DNA

<213> Artificial Sequence

35 <220>

<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 45

40 gttgacgtca tccacatatt ggagatgttg t 31

<210> 46
<211> 29
<212> DNA
5 <213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

10 <400> 46
gttatcgcta gcatggagca ctgtaatga 29

<210> 47
<211> 35
15 <212> DNA
<213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to obtain raffinose synthase gene.

20 <400> 47
aacgagctca atccaaaatc tcatcaaata atcgc 35

<210> 48
25 <211> 25
<212> DNA
<213> Artificial Sequence

<220>
30 <223> Designed oligonucleotide primer to obtain raffinose synthase gene.

<400> 248
acaatagttg agggcggaag agtag 25

35 <210> 49
<211> 25
<212> DNA
<213> Artificial Sequence

40 <220>

<223> Designed oligonucleotide linker to obtain raffinose synthase gene.

<400> 49
gatcgagctc gtgtcggatc cagct 25

5

<210> 50
<211> 17
<212> DNA
<213> Artificial Sequence

10

<220>
<223> Designed oligonucleotide linker to obtain raffinose synthase gene.

<400> 50
15 ggatccgaca cgagctc 17

<210> 51
<211> 30
<212> DNA
20 <213> Artificial Sequence

<220>
<223> Designed oligonucleotide primer to confirm direction of the inserted
raffinose synthase gene.

25

<400> 51
cctcctcgga ttccattgcc cagctatctg 30

<210> 52
30 <211> 30
<212> DNA
<213> Artificial Sequence

<220>
35 <223> Designed oligonucleotide primer to confirm direction of the inserted
raffinose synthase gene.

<400> 52
ggattcgaca caaaccgcca cgatcatgctc 30

40

- <210> 53
<211> 29
<212> DNA
<213> Artificial Sequence
- 5
<220>
<223> Designed oligonucleotide primer to confirm direction of the inserted
raffinose synthase gene.
- 10 <400> 53
tctacgtctg gcacgcgctt tgcggctac 29